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## Analysis of Metal Fe at Algae *Eucheuma cottoni* in Region of Baubau Coastal

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**Abstract.** *Eucheuma cottoni* (called algae) is one of plant that usefull for human life as well as alternative energy, bioaccumulation of metal in waters, food, fertilizer and health. This study aims to determine the concentration of iron (Fe) metals in *Eucheuma cottoni* in the region of Baubau coastal. The concentration of Fe metal was determined by atomic absorption spectrophotometer (AAS). The destructed process had done by HNO<sub>3</sub> concentrated. In the measurement of Fe with the highest concentration in Lowu-Lowu district with value of 0,4885 ppm while the lowest concentration in Palabusa with value of 0,0498 ppm. The results showed that the concentration of Fe metal is corresponding with PP No. 82 tahun 2001 on Water Quality Management and Water Pollution Control.

### Introduction

Seaweed is a waters ecosystem that very ecologically important and plays an important role in the diversity of the coast. Seaweed also has an important role in the coral reef ecosystem (Satheesh and Wesley, 2012). The increasing of human activities in coastal waters will cause disruption to mangrove forests (Kariadi, N.T.M, 2014), coral reefs (Ika, 2012) and seagrass beds (Putra, A.B, 2019). The degradation in the water area will affect the water environment. Pollution of coastal waters can be defined as negative impacts that affecting on biota life, resources and aquatic ecosystems, human health. The pollution of aquatic ecosystems can be caused directly by the disposal of materials or waste into waters originating from human activities ( Marganof in Raya, 2012).

Seaweed lives in seawater while in seawater containing some pollutant minerals and heavy metals due to industrial activities and waste disposal that containing toxic substances. Some heavy metals in marine such as lead (Pb), cadmium (Cd), mercury (Hg), zinc (Zn) with excessive concentrations are toxic and dangerous (Lamai, 2005). These metals are included in non-essential elements for organisms, especially in seaweed. Some heavy metals such as copper (Cu), iron (Fe), cobalt (Co), manganese (Mn) and others are type of essential heavy metals which certain are

needed for living organisms, especially seaweed (Nopriani, 2011).

Biomass originating from algae had attracted the interest of many researchers because of the carbohydrate and polysaccharide content that making seaweed used as food and fertilizer (Jang, et al, 2012). Besides the using of seaweed in food, it is widely used in research such as production of Bioetanol (Candra, 2011), metal bioaccumulation (Raya, 2012), antioxidant (Citrate, 2012), antibacterial (Siregar, 2012), and antibiotics (Naid, 2013).

Baubau is one of the largest of producing seaweed centers in Southeast Sulawesi. The species of Seaweed is cultivating like *Eucheuma cottoni*. The rate of economic growth that happened in Baubau not only gives the positive influence on the regional economy, but also have the negative impact on the waters. The adverse effects in the form of pollution at seawater is by industrial waste or anthropogenic activities. However, in recent years the changes that have occurred in the waters of Baubau coastal are very significant influencing the quality of seaweed. The decreasing with the less number of cultivating seaweed production are factors affecting the quality of seaweed in the city of Baubau. This study aims to determine the content of iron metals (Fe) in seaweed as an indicators of water pollution in the area. Determination the concentration of Fe in seaweed using Atomic Absorption Spectrophotometry along with destruction sample by HNO<sub>3</sub>

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concentrated.

## Experimental

### Material and Methods

The tools used in this research like glass tools commonly used in laboratories, Atomic Absorption Spectroscopy Variants, refractometer, porcelain cups, funnels, GPS, ovens, electric baths, pH meters, analytical balance, icebox, freezers, and mortar. The material in this study were *Eucheuma cottoni*, aquadest, seawater, aluminum foil, 65% HNO<sub>3</sub>, HCl, Fe standard solution, ordinary filter paper and whatman paper 42.

### Sample Preparation

Sample was cleaned from impurities using aquadest then dried in an oven at 60 °C until turning in blackish brown colour. The dried sample had crushed into powder and homogenized with a mortar. This dried sample had weighed as much as 5 g in a clean porcelain cup containing 20 mL of HNO<sub>3</sub> solution. As much 20 mL of HCl was added then destructed. The results of sample destruction filtered using Whatman 42 and clear solution obtained. The filtrate put in volumetric flask and ready for analysis by the Atomic Absorption Spectrophotometer AA-7000 series.

### Preparation of Fe Standard Solution

In preparing of the standard series of Fe are done as follows: 0; 0,5; 1; 2; 4; and 8 ppm, then the samples are analyzed with the variant atomic absorption spectroscopy.

## Result and Discussion

### Sampling Conditions

The temperature of the Baubau coastal waters as the result of measurement at the time of sampling is around 29-30 °C. Seawater temperature in the waters of the City of Baubau is in normal conditions because at normal seawater temperatures between 21-32 °C while the water temperature in Indonesia is 27-31 °C. This temperature

range is enough to support the growth of seaweed. According to Abirami, (2011) and Susilowati, (2012), seaweed can grow in 26-30 °C.

**Table 1.** Seawater sampling conditions.

Location	Temperature (°C)	pH	Salinity (‰)
Lowu-Lowu	29	7,0	33
Kalia-Lia	30	7,5	34
Kolese	29	7,0	33
Palabusa	30	7,5	34

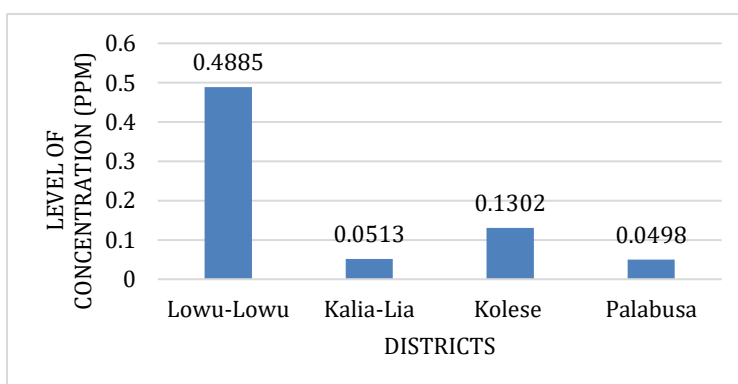
Optimum growth of seaweed will increase its ability to accumulate metals. Temperature is an important factor in regulating the life processes and spread of organisms. Temperature does not only affect the metabolic processes of the organism but also the activity of dissolving chemical compounds.

The degree of acidity (pH) is one of the parameters that affecting the life of seaweed. Generally, the pH value of the marine environment which supporting the life of aquatic biota is 7.7-8.4 (Fretes, 2012). The pH result of the seawaters measuring at the time of sampling is around 7,0 - 7,5. The acidity content of seawater is caused by the amount of metal content or organic waste in these waters.

Salinity is one of the variables that determines the life of aquatic organisms, especially on the osmotic balance with their environment. According to Widowati (2018), salinity in waters that showing optimum growth in seaweed is 28 ‰. Compared with the salinity in the waters of the City of Baubau is around 33-34 ‰. The Salinity in the optimum environment is enough for seaweed growth.

### Determination of Fe Metal Concentration in Algae

The results of the study of the concentration of Fe metal found in marine algae type *Eucheuma cottonii* seen in figure 1.



**Figure 1.** The Concentration of Iron (Fe) in some area.

The Fe concentrations of each location is ranged from 0.0498 to 0.4885 ppm. The highest level at the Lowu-Lowu district was 0.4885 ppm while the lowest in Palabusa with 0.0498 ppm.

Fe is one of the heavy metals that can be polluted the environment when in pass the standart level of Fe. High levels of Fe in seaweed due to the process of accumulation in the waters. Fe had absorbed by seaweed from the water environment or phytoplankton and microorganisms that have accumulated Fe metal (Widowati, 2008). In addition, the increase of Fe concentration can influenced by environmental factors by household waste pollution and the activities of human in the aquatic environment. In the city of Baubau, there are several downstream rivers that empties into seawater which is likely to result in changes in water quality that have a major impact on the growth of seaweed. Based on the results study, the content of Fe on seaweed from all locations ranging from 0.0498-0,04885 ppm, and these results are already pass the quality standarts by Goverment Regulation No. 82 of 2001 where the Fe quality standart is on less than 0,3 ppm.

## Conclusion

The concentration of Fe in *Eucheuma cottonii* seaweed, the algae from each location ranged from 0.0498-0.4885 ppm.

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## Conflict of Interest

The authors disclose no conflicts.

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